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The Engineers' Architects' and Builders' News

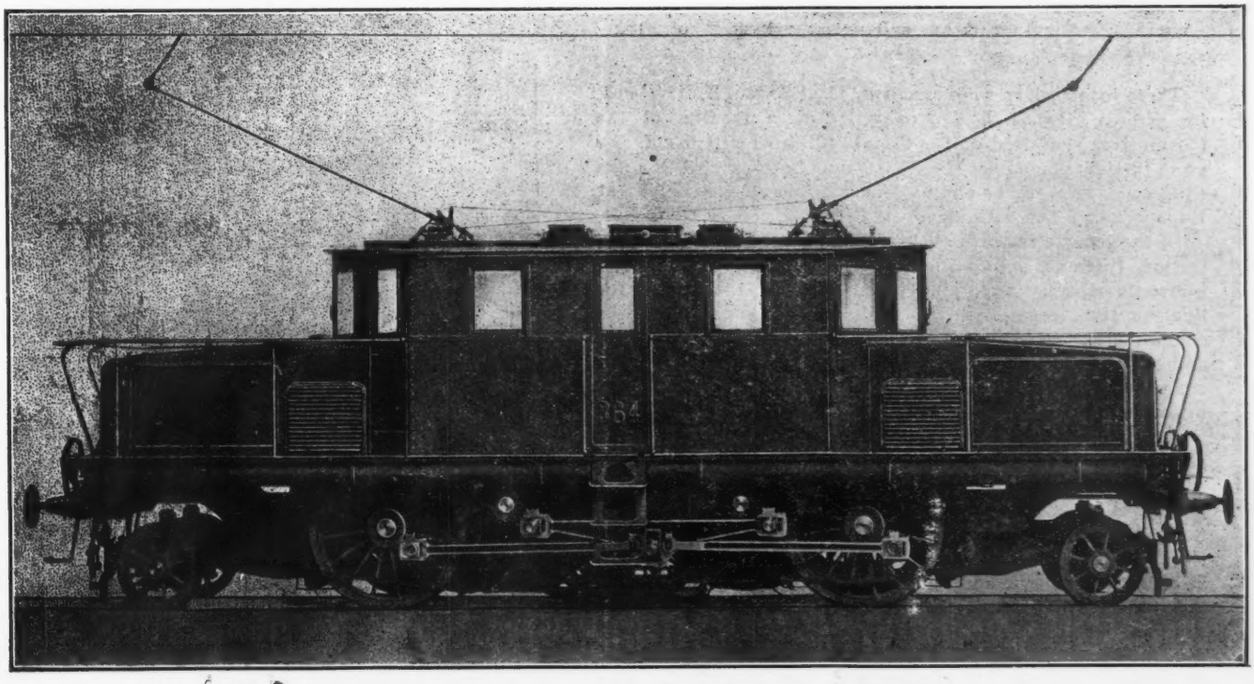
VOLUME XVI SAN FRANCISCO, CAL., JUNE 30, 1906 No. 13

The New Simplon Three-Phase Locomotives.

The Milan Exposition, which is now being held in Italy, is in celebration of the opening of the Simplon Tunnel. This exposition covers an area of nearly 1,000,000 square meters, the buildings occupying a space of 245,300 square meters. The Simplon Tunnel Railway is electrically equipped, the locomotives being of the three-phase type of 1000 horse-power capacity. The trolleys are of the two wire construction, the span wires being located about twenty-five meters apart. On the arrival of a train at the Brigue station the steam locomotive is removed, and one of the electric locomotives, shown in the accompanying illustration, hauls the train through the tunnel, which is twelve miles long. The electric locomotive is then removed, a steam locomotive taking its place.

The details of construction of the electric locomotives are of more than passing interest, and have just been received in this country. The accompanying diagram and photographs show the rotors, as well as the stators of the three-phase motors employed, also the controlling mechanism and the electrical connections. There are three driving axles, having a wheel base of 4.9 meters, while the total wheel base, including the two pilot axles, measures 9700 millimeters. To the driving axles two motors are connected with connecting rod, well balanced by four counter-weights, two on each side of the frame; the total length of the locomotive over the buffers is 12,320 millimeters, and the drawbar pull of the locomotive at a speed of thirty miles per hour is six tons, while the drawbar pull at the highest speed of forty miles per hour, or from sixty to seventy kilometers per hour, is 3.5 tons. The total weight of the locomotive is sixty-two tons, of which the electrical equipment weighs twenty-eight tons, and the mechanical equipment thirty-four tons, while the weight on the driving wheels is about 84,000 pounds.

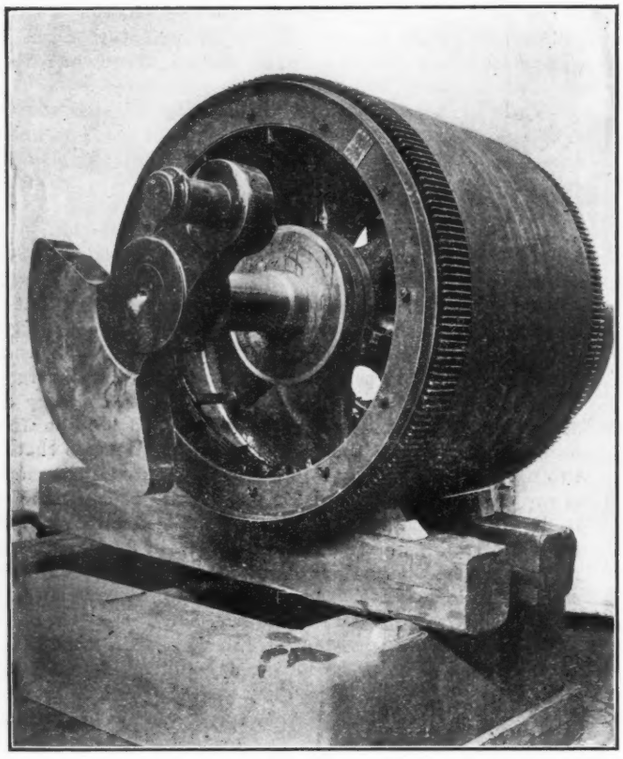
As will be noted by the accompanying illustrations and drawings, there are four doors in the cab of the locomotive, one at each side and one at each end. Practically all of the electrical equipment is installed in the cab, the rheostats, however, being placed at the ends of the locomotive, with ventilating openings as shown in the illustration. The driving wheels are 1640 millimeters in diameter, while the smaller wheels measure 850 millimeters in diameter. The current collecting devices employed are so arranged that the locomotive can travel in either direction without changing the position of the trolley pole, and at the center of the tunnel switching tracks are provided so that in cases of emergency trains may pass at this point, although under ordinary conditions no passing of trains is expected to be found necessary. Switches are provided at this siding so that the two halves of the trolley line may be separated. The current is supplied from hydro-electric power stations at Brigue and Gelle, a three-phase current being conducted over the feeder lines and trolley wires, having a pressure of 3300 volts and a frequency of 15 period per second. There are two speeds which this locomotive may be operated at normally, the lower speed being 34 kilometers per hour, and the higher speed 68 kilometers per hour. The normal drawbar pull at the latter speed is 3500 kilograms, and the maximum 9000 kilograms. The drawbar pull at a speed of 34 kilometers per hour, normal, is 6000 kilograms, and at a maximum



FIRST BROWN-BOVERI SIMPLON THREE-PHASE LOCOMOTIVE NO. 364.

14,000 kilograms, the maximum capacity of both motors being 2300 horsepower, while the normal capacity of both of the electric motors in ordinary operation is 900 horsepower.

The weight of the motors with connections is 10.75 tons, and they are capable of handling passenger trains weighing nearly 400 tons and freight trains weighing nearly 500 tons without difficulty, the time required for hauling the former through the tunnel being about one-third of an hour, and the latter about two-thirds of an hour. In one direction the grades are somewhat heavier and require a correspondingly greater time, the up grade on the north side from Brigue to the center being about seven per cent., while the highest grade for short distances are as great as ten per cent.

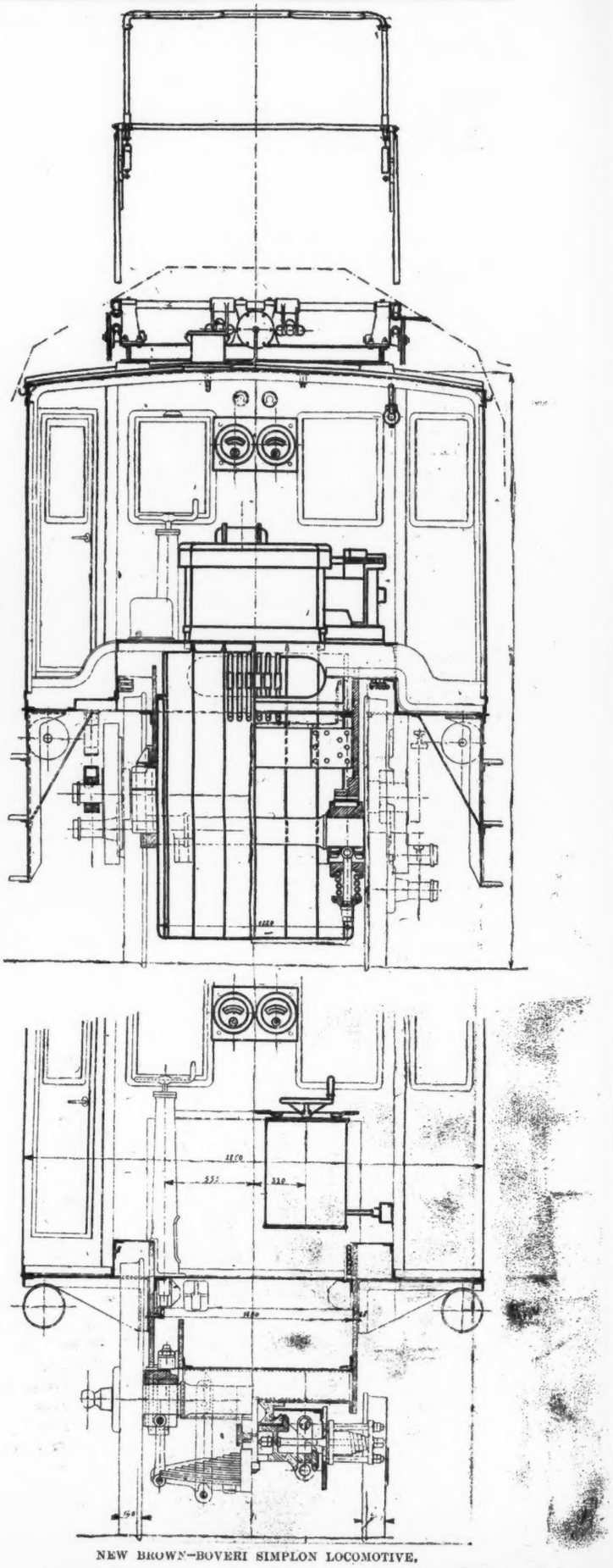


ROTAR OF BROWN-BOVERI LATEST SIMPLON TUNNEL LOCOMOTIVE NO. 365.

These locomotives were constructed at Baden, Switzerland, by Brown, Boveri & Company, while a portion of the locomotives also used on the Simplon Tunnel will be of the same type employed on the Valtillina Railway, which was equipped with three-phase locomotives constructed at Budapest by Ganz & Company.

In the locomotive cab shown in the accompanying illustration, there are step-down transformers provided of seven kilowatts capacity supplying a current of 110 volts for lighting the locomotive, as well as for operating two compressors. These transformers are of the oil-dooled type, and the current is delivered to two electric motors each connected to an air compressor for operating Westinghouse brakes, and also for operating the controlling mechanism. These compressors supply air at a pressure of 7.5 atmospheres, and have a capacity of 4.15 meters per minute.

Each of the large motors has a capacity of 575 horsepower, with a maximum output of 1150 horsepower, while under normal conditions only 390 horsepower is required from each motor when operating at a speed of thirty-four kilometers per hour, and 450 horsepower when the locomotive is traveling at the rate of sixty-eight kilometers per hour, the pressure being from 2700 volts to 3000 volts, and the frequency fifteen cycles per second. The insulation of the motors between the windings and the iron frame and



NEW BROWN-BOVERI SIMPLON LOCOMOTIVE.

cores was tested to 10,000 volts, with alternating current. The efficiency of the moters when operating at a speed of from sixty to seventy kilometers per hour, with a drawbar pull of 3500 kilograms, is said to be eighty-five per cent., while an efficiency of eighty per cent. is obtained when the locomotives are operating at from thirty to forty kilometers per hour with a drawbar pull of 6000 kilograms. The motors may be operated without danger from overheating 200 seconds, with an overload of 100 per cent. or for an hour with an overload of fifty per cent., the temperature not exceeding forty degrees C. above the temperature of the surrounding atmosphere during such overload. These motors are designed to operate ten hours at full capacity, and at normal speed, without the winding of the motors being heated above sixty degrees C. higher than the surrounding atmosphere.

These locomotives were watched with great interest in their tests at the opening of the Simplon Tunnel, which has just taken place, and there is every reason to believe that the Milan Exposition now being held in celebration of this event will be very largely attended. This exposition will undoubtedly give great impetus to the use of electricity throughout Italy, and a large number of hydro-electric stations in northern Italy particularly, will tend strongly toward the development of electrical industries in that country, and will ultimately result in the operation of all of the present steam railways in that section of the country by electrical power.

MERITED PROMOTION.

Mr. E. L. Wayman, who for the past five years has been prominently identified with the Western Electric Company and the California Electrical Works, has been appointed general manager of the latter company upon the retirement of Mr. L. E. Sperry, who resigned his position that he might devote his entire time to his lumber interests in Oregon. The JOURNAL, as well as their many friends, wish each success.

SELF-SYNCHRONIZING OF ALTERNATORS.

A paper by Prof. Morgan Brooks and Mr. M. K. Akres, read at the recent Milwaukee convention of the American Institute of Electrical Engineers, described a convenient method of placing alternators in parallel without causing the circulating current to exceed a certain desirable limit. Instead of directly closing the switch between two machines and thus subjecting them to a possible impulsive rush of current if the machines are not in the proper phase positions and revolving at the proper speeds, an inductance without an iron core was inserted between the two alternators. The inductance prevented a dangerous rush of current even at maximum difference of phase, and yet the current which did flow produced an adequate synchronizing force to draw the machines into step.

The experiments were conducted with 60-cycle current and the results were very satisfactory. The circuit between the machines could be closed while the machine to be brought into step was at a standstill; when the speed was approximately synchronous, it would automatically fall into step, and after which the excitation could be adjusted and the inductance cut out.

In the case of a synchronous converter, started from the direct-current side, the use of coreless inductance to permit the closing of the connecting switch at any instant was sometimes found to cause the converter to race as a direct-current motor, owing to the weakening of its field and consequent increase of armature current. This objectionable tendency was overcome by the use of a second inductance connected in series with the direct-current armature and additional to the starting box.—"Electrical World."

The Reinforced Concrete Bag House of the Selby Smelting and Lead Co.*

BY JAMES C. BENNETT.

The work of building the bag house was done by the Lindgren-Hicks Company of San Francisco, under the form of contract know as the "Cost-plus-a-fixed-profit plan." The plan of work and the methods followed by the contractors proved so entirely satisfactory to the smelting company that a contract was let to the same firm for a second building, not long after the commencement of work on the bag house. By this plan of working, the owner secures the use of the equipment and the organization of the contractor for about the same, or possibly less, money than would be required to buy the plant alone for his own use, and he would then have it on his hands afterward with little or no chance of disposing of it for enough even to cover but a small part of its cost. Under this plan, the materials are all ordered by the contractor, and the bills are subject to his approval, before payment.

An encouraging feature of this work, for the Pacific Coast, is that it was done entirely by local firms. The cement was

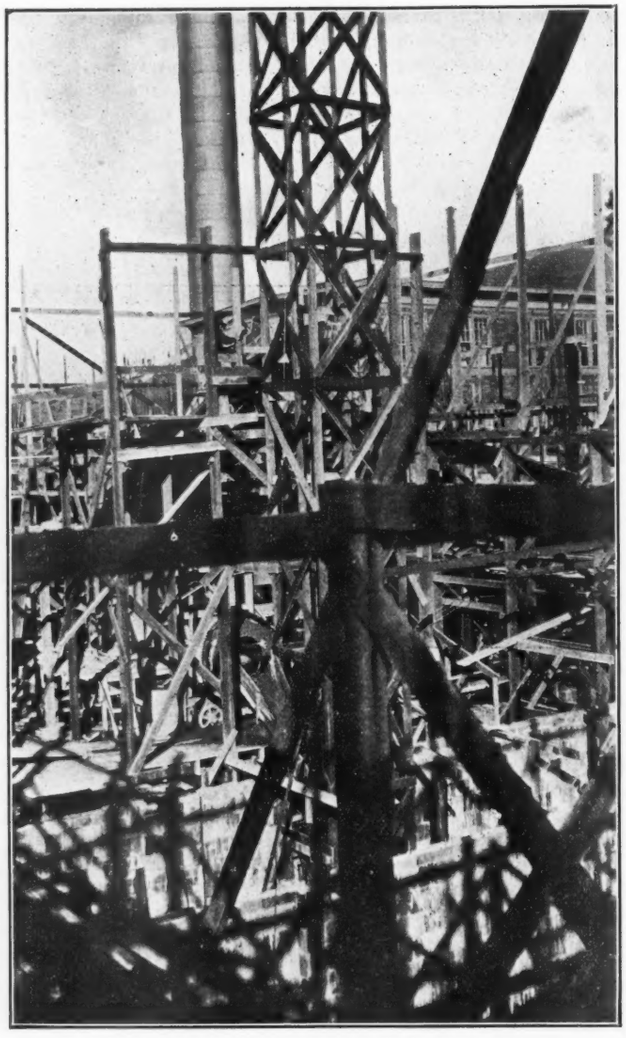
IN THE COMBUSTION FLUE.

of Coast manufacture, and the steel work was furnished by the Risdon Iron Works. To avoid the necessity of especially organizing a gang of steel erectors, the structural work was contracted for "erected in place."

The materials were practically all received by rail. A long line of bunkers was erected along the sidetrack, and the sand and gravel were shoveled from the cars directly into them. The cement was unloaded near one end of the bunkers, so that all of the materials were thus concentrated into one place. The bunkers were set sufficiently high to admit of running small tram cars under the chutes, thus drawing the materials directly into them. The cars were then pushed by hand to a point in the extended center line of the building, and at a distance of about sixty feet from the end wall. At this point was the foot of an incline running into the building and extending to its center, where was erected a floor and a small bin or bunker for the mixing platform. The concrete mixer was placed on this platform at an elevation of about sixteen feet above datum, with the bunker immediately above. The materials were mixed in their requisite proportions in the bin by dumping successive cars of the sand and gravel, respectively, thus leaving only the introduction of the cement, which was done in the small hopper between the bin and the machine. The mixer and two hoists were run by a motor placed in a temporary shed beneath the platform. From this position, the concrete was dropped through a chute to the ground level for the lower part of the work. As the walls rose, they were served by runways whose elevations were increased to suit the heights. The chute from the mixer was shortened to correspond to the changes of the runways, until they

* Continued from issue of June 23.

attained a height level with that of the mixer platform. From this elevation the runways were built on a rising grade from the mixer to the sides of the building, until a rise of about four feet was gained. After this, the elevator was placed in service, and the runways were then elevated without regard to the height of the mixer. The elevator consisted mainly of an unbalanced bucket, held in an upright by three guides, one on each side and one in front. The front guide controlled the dumping and the righting. The travel of the bucket was of such length that the concrete from the mixer was discharged directly into the bucket. At



RAUSOME ELEVATORS.

the top, the dumping position was maintained at such a height that the concrete emptied into a bin whose capacity was slightly greater than one bucketful, thus admitting of slight irregularities in the use of the wheelbarrows.

The wall work progressed at the rate of about one foot per day from the ground to the bag floor—fourteen feet. For this height, it will be remembered, the exterior walls were faced on one side, and the interior walls on both sides, with the fireclay tiling. The placing of this tiling was a rather slow process, as the tile could only be maintained in position for a depth of one course—twelve inches—in advance of the concrete work. After passing the bag floor, there remained but the four exterior walls, which were fitted with no facing, thus reducing the upper work to a common basis with the average structure of this material. This upper work advanced at the rate of about two feet per day.

One very interesting feature of the structure, or, more strictly speaking, of the installation, was the flue system connecting the main building to the existing system of flues and to the main chimney. It is essential that the gases entering the bag house shall have a temperature not exceeding 180 degrees Fahr., as experience has shown that a higher degree of heat than this will destroy the bags very rapidly. As the gases entering at the base of the stack had a temperature of nearly three hundred degrees, it was necessary to very materially reduce the temperature. This was accomplished by separating the objectionable elements from those which were purely products of combustion, in the commonly accepted sense. The "combustion" gases were carried in a separate flue and discharged into the base of the stack, thus furnishing a motive column for the exhaust of the filtered gases from the upper part of the building. This separation still left the gases of too high a temperature for safety, however, so that it was necessary to still further lower it. To accomplish this, a flue made of steel plate and of liberal cross section was adopted. This form of construction was used from the point where the gases leave the old brick flue to the entrance to the fan, at the corner of the building. A steel plate fan is used with a fan wheel eleven feet in diameter, by five and a half feet wide, and capable of handling 87,000 cubic feet of air or gas per minute at its rated speed. The fan discharges the gases into a flue of concrete, lined with tile, built against the side of the main building, and having one common wall with the latter. This flue is rectangular in exterior section, and divided by a sloping floor into two flues having no connection with one another. The upper part is of the same cross sectional area as the steel flue leading to the fan. The lower part is very much smaller, as it is only for carrying the gaseous products of the combustion of the dust which is accumulated on the floor of the lower part of the building. As there will be but one of the compartments closed and burning at any one time, the flue area may be very much smaller than the inlet. This lower, outlet, flue is connected with the main flue for the outgoing gases at the corner of the building near the fan. The lower flue is built without lining as the gases which it has to carry are deprived of their destructive qualities and the heat is not sufficiently great to do the concrete any harm.

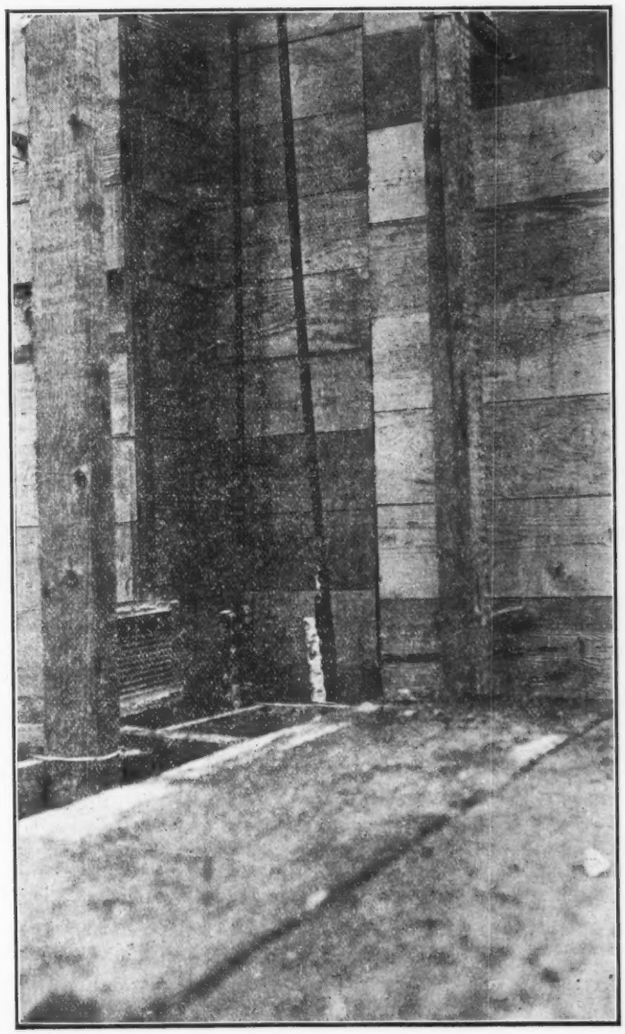
The filtered gases are withdrawn from the upper part of the building through a large oval opening in the end wall next the fan, and at the corner, immediately under the roof. From this exit the gases are drawn downward through a concrete flue to a point about seventeen feet above the ground. This marks the level of the horizontal flue which connects with the base of the main stack. This horizontal flue extends in a direction perpendicular with the end wall of the building for some distance, and then turns at an angle of ninety degrees, from which point it leads directly to the base of the chimney. It is carried on the same supports as, and immediately over, the steel inlet flue. There are two or three decided gains by the use of this design, viz: ground space, which, in this instance, is quite valuable; reduction of foundations, as piers of sufficient area to support the weight only are required, the weight of the concrete flue above adding enough to more than equal the overturning movements due to the wind pressure; and the lesser amount of structural material required for supporting the flues. Doors were provided in the sides of both inlet and outlet flues for the purpose of clearing them of accumulated dust. This will be considerable in the lower flue, but there will probably be but a small amount in the upper one, as it is all removed in the bag house. The doors are reached by means of ladders attached to the supports at intervals. The outlet flue is unlined.

There are a number of dampers provided throughout the flue system for the proper manipulation of the flow of gases. At the point where the steel flue leaves the original system, there is a damper for the purpose of cutting out the bag

house entirely, and there is also one in the main flue at this same point for directing the gases either to the bag house or direct to the stack. There is an inlet damper for each compartment of the building, and an outlet from each compartment for the gases resulting from the sintering of the accumulated dust. The last damper is at the base ofthe chimney, and in the outlet flue, for the purpose of further cutting off the bag house and thus relieving the stack of so much extra duty. The two dampers mentioned as being at the branching point of the inlet flue are each made of one large sheet of steel—about twelve feet long, seven feet wide, and one quarter of an inch thick. Each of these dampers is arranged for easy and rapid manipulation in order that the flow of gases may be quickly changed. This is essential as the fan is driven by an electric motor, and, as there are possibilities of unexpected stoppages of the current, it is necessary that such provision be made, as an unexpected cessation of the flow of the gases may lead to serious consequences in other parts of the plant. The dampers in the branches of the inlet and outlet flues, and the one in the outlet, at the stack, are of the butterfly type, and are all operated by means of vertical shafts extending above the top of the flue, which is used as a runway or gallery alongside the main building, enabling the attendants to enter on the bag floor in case of necessity.

Owing to the recent fire in San Francisco, it is impossible to give records of the cost of this work, as was originally intended, the records of the Lindgren-Hicks Co. having been destroyed. The author was told, however, during the progress of the work, and before the occurrence of the fire, that the concrete in the walls cost between three and four cents per cubic foot placed in position.

(Concluded.)



A SAMPLE TILE.

NEW BLOOD IN THE CALIFORNIA ELECTRICAL WORKS.

[From ENERGY]

The great expansion of the electrical business on the Pacific Coast has taxed the ability of the electrical people in extending their organizations to meet new conditions. We feel extremely fortunate in being able to announce the following additions to our sales force which the large increase in our business has made necessary.

Mr. P. J. Aaron, who has just arrived in Seattle to open our Northwest branch, was formerly allied with our Chicago office. His wide experience in the Middle West, both technical and practical, places him in an admirable position to handle the extensive line the Company is now manufacturing. The great growing Northwest should offer unlimited fields for the disposal of the various types of alternating current machinery that the Western Electric Company is now placing on the market, and it will be Mr. Aaron's aim to establish the prestige it enjoys in the East and Middle West.

MR. P. J. AARON.

The rapid growth of our San Francisco business required the re-organization of our City Sales Department, and Mr. A. M. Funke, formerly manager of the Standard Electrical Works, was engaged for the position. Mr. Funke's wide city acquaintance should stand him in good stead in the important work before him.

MR. A. M. FUNKE.

MR. B. C. HOLST.

Mr. B. C. Holst's experience with transformers, meters and incandescent lamps is proving valuable not only to ourselves, but to the California trade as well, whom Mr. Holst is calling on as rapidly as possible. Mr. Holst's territory includes Northern California, Nevada and part of Oregon, and we feel that our trade in those sections will be looked after in the best possible manner.

Mr. W. P. Thomas, local manger of the Snow Mountain Water and Power Company (formerly the Eel River Power and Irrigation Company), reports everything at the works in excellent condition; no injury whatever to the cement dam near John Day's from the earthquake. Operations have been suspended for the present on account of the shortage of supplies.

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EDITORIAL

ELECTRIC POWER AND TRANSPORTATION

Independent of the fitness of the trolley car for use on city streets, either from the æsthetic or practical point of view, it must be admitted by all that it is the most flexible and reliable means of transit which has been developed for public use up to the present time.

The automobile has firmly established its right to serious consideration where the public is to be served in very small numbers. Whether for long runs on the Nevada desert, over mountain roads at temperatures below zero, or for short bursts of speed at times of emergency on crowded city streets, the automobile has been found to fulfill every requirement. Notwithstanding that its high state of development has been reached largely on account of its use in the pursuit of pleasure, the time has now come for the utilitarian side to be given serious consideration.

The gasoline motor car for railway service is undoubtedly a development brought about by the extensive use of gas engines in automobile service. What place the gasoline motor car will ultimately take in the passenger transportation field in connection with suburban and interurban service remains to be seen, but it certainly comes nearer the electric trolley for general use than any other motor car—speed control, economy of operation and satisfactory service being the criterion. As in the case with automobiles each unit is independent of all other units. While this is an advantage in one respect it is a decided disadvantage in another. A shut down in the case of a large electric railway system may occur, yet the probability of such an occurrence is much less than an individual breakdown where a large number of different motor cars are operated.

The use of the trolley, which has made the electric car so successful, has of necessity practically excluded the use of electricity in automobiles or individual motor cars. While storage batteries are used to some extent yet the electric automobile is to-day as exceptional as is the gasoline motor car for general railway service; at the same time the electric trolley car and gasoline automobile are equally successful as well as indispensable.

Except in particular instances the cable car does not begin to meet the requirements. The necessity for constant speed places it at a very decided disadvantage as compared with either the gasoline motor or the electric car. As an underground system the cable certainly has many advantages, but wherever the necessity arises an electric underground system is certainly to be preferred not only because of the great variation of speed which is allowable, but also on account of the much higher efficiency in the application of power to the individual cars.

The simplicity of construction and the ease with which changes can be made in the trolley system make it the most satisfactory which can be used under ordinary circumstances.

The third rail system makes it possible, perhaps, to operate at greater speeds than may be done with any motor yet devised, but at present there are other conditions which need more serious consideration than the limit of speed due to the trolley.

PERSONALS.

Mr. C. Wiggin, formerly secretary of the Contractors' Association, has been appointed chief clerk and storekeeper of the California Electrical Works.

Mr. C. K. Gilbert, of the city sales department of the California Electrical Works, has been transferred to a responsible position at the Seattle branch office.

Mr. A. J. Turner of the Chas. C. Moore Co., engineers, leaves this week for an extended trip through the Northwest on pleasure bent.

Among the passengers leaving New York for Liverpool, June 19th, on the Cunard steamer "Caronia," was President W. H. Whiteside of the Allis-Chalmers Company, who, accompanied by his wife and daughter, will devote several weeks to a recreation trip abroad. Mr. Whiteside and his family will visit various points of interest in England, Germany, Switzerland and France, spending most of their time on the Continent.

NEW YORK NAVY YARD ADOPTS STEAM TURBINES

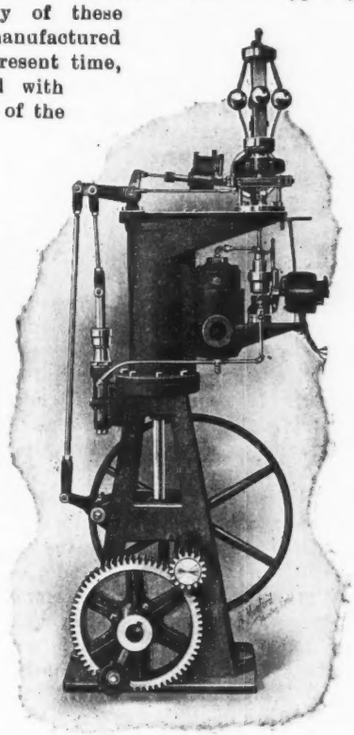
The Navy Department in its recent power extensions to the New York Navy Yard has, through its bureau of Yards and Docks, adopted Westinghouse-Parsons steam turbines, which will be installed in building No. 41.

The present installation will comprise two 500 kilowatt units operating under 150 pounds steam pressure, 28 inch vacuum and on superheated steam at 100 degrees Fahrenheit. The power plant supplies three-phase alternating current at 2300 volts, and 60 cycles frqeuency, to machine shops, dry docks, and other general purposes about the New York yards, including lighting of buildings. The contract for these turbines was secured on rigid Government specifications and under strong competition. Boilers will be of the Stirling water tube type, with Foster internal superheaters. Worthington surface condensers will be used.

This will make the second turbine plant the Westinghouse Machine Company has installed for the Navy Department, the first one being at the Boston Navy Yard, where the turbines have been giving very good service.

Trade Catalogues.

Bulletin No. 106 of the Lombard Governor Company gives a complete description of their latest or type Q governor. About sixty of these governors have been manufactured and are in use at the present time, and the results obtained with them have shown wisdom of the new design.



The Type Q governor is vertical as contrasted with the well known horizontal types B. and D.

There are two sizes made known as the Q-6 and Q-7½, developing 6700 foot-pounds and 10,000 foot-pounds respectively. The type N vertical governor manufactured by the same company is much larger, having capacity of31,000 foot-pounds, and the accompanying illustration of the new type Q governor shows in detail its general construction.

The valve mechanism is such that the sensitiveness of the governor may increase or diminish as desired during the time that the governor is in operation; also the maximum speed of motion of the turbine gates may be varied through a wide range by the adjustment made possible of the relay valves.

The Lombard Governors are sold on the Pacific Coast by Pierson, Roeding and Company.

Small polyphase induction motors for use on two- and three-phase systems, frequency either 25, 40 or 60 cycles per second and voltages 110, 220, 440 and 550, are described in Bulletin No. 149 of the Stanley-G. I. Electric Manufacturing Company, whose Pacific Coast office is in the Atlas Building, San Francisco. These small motors are designed particularly for the best results, special attention having been given to the details of constrution of the armature, field winding, lanunated punchings and temperature rise. They will give their full rated output continuously with a temperature increase of not greater than 40 degrees C., and 25 per cent. over-load may be carried without the temperature exceeding 55 degrees C.

The Wagner Electric Manufacturing Company of St. Louis, have issued a circular describing and illustrating their switchboard and general test instruments. Bulletin No. 67 gives details of their switchboard instruments, while Bulletin No. 71 is confined exclusively to their portable instruments.

ANNOUNCEMENT.

We wish to annouce that our mail address on and after July 1st, 1906, will be Rooms 403-4-5-6 (Fourth Floor) Atlas Building, No. 604 Mission St., San Francisco, and that our Oakland Branch Office, now at Rooms 67-68 Blake Block, Oakland, will be closed very shortly thereafter.

Stanley-G. I. Electric Mfg. Co.
Northern Electric Mfg. Co.
Fort Wayne Electric Works.
Sprague Electric Co.

Industrial.

PROCEEDINGS OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

A large attendance, says the Electrical Review, marked the opening session of the twenty-ninth convention of the National Electric Light Association, which was called to order on Young's Pier, Atlantic City, N. J., by President W. H. Blood, Jr., Tuesday morning, June 5, at 10:15 o'clock. Mr. Blood introduced the Hon. F. P. Story mayor of Atlantic City, who extended the right hand of fellowship and a hearty greeting.

The president then presented his annual address, saying in part:

"Our relations with the underwriters have, during the past year, been pleasant, partly because there has been no question at issue between us and also because we are becoming better acquainted with each other. The policy of having a representative of the association devote the larger portion of his time to insurance interests and to settling differences between the members of the association and the underwriters has been approved by the executive committee, and is now referred to the incoming board for early action.

"The year has show a healthy growth of the electric lighting business, but it is not notable as having given birth to any marked innovation in the physical part of the business. The size of generating units continues to increase, distribution by high-tension alternating current is becoming more and more general, and minor improvements all along the line are extending the utility of the system. Undeveloped water powers, which a few years ago were valueless, are to-day being eagerly sought out, and by means of improved water-wheels and high tension lines are being made available for large sections of the country. Gas engines, steam turbines and other prime movers are receiving the careful attention of enterprising engineers, because we are all beginning to realize, more and more forcibly each year, that the great losses between the coal pile and the dynamo must be cut down."

The first business taken up was the report of the committee on progress, which was presented by T. Commerford Martin.

It was estimated in this report last year that there were 4200 central station enterprises. The current issue of the authoritative Central Station List for the first quarter of 1906 contains the names of 4839 plants, of which 3732 were under private and corporate management and 1107 were municipal. The gain in six months has been 301 plants, or 600 for the year, a very close proof of the maintenance of a steady and high rate of increase. While of these new plants in the first half of 1905-6 no fewer than forty-eight were in Texas, the older states were notably leaders in activity, Pennsylvania accounting for twenty-one and New York for eighteen, Ohio and Michigan for fifteen each.

An increase of fifteen per cent. over 1904 would bring the investment in distinctive central plants up to $700,000,000 in 1905. The gross earnings are estimated at $135,000,000, expenses on which at seventy per cent. would amount to $94,500,000. As a matter of fact, the output of current was everywhere much larger than ever before, but the rates obtained were frequently much lower than ever before.

W. S. Barstow, Portland, Oregon, read a paper on "Mercury Arc Rectifiers System, with Magnetite Lamps for Street Illumination."

In the city of Portland, Ore., about two years ago this system was installed on a small experimental scale. About one year ago the results appeared so promising and so much progress had been made in such a short period that an order was placed to install the entire system of over 1200 lamps in Portland with mercury arc rectifiers and magnetite lamps. There have now been in operation in Portland for several

months over 800 lamps with rectifiers, and the installation is being rapidly increased as fast as deliveries can be made. The system has proved successful and has fulfilled expectations.

A paper entitled "Mechanical Refrigeration" was read by John Meyer.

At the present time central station interests are scanning the field for sources of revenue other than that derived from the sale of current for arc and incandescent lighting. Mechanical refrigeration, having as its source of power the electric motor, is an outlet for our produce and deserves much consideration. The paper deals with this subject, practically new from a central station point of view.

The refrigeration question introduces problems distinctly technical, and it is hardly possible to work up a large load through the regular soliciting force, except possibly to interest the prospective consumer, after which the question should be referred to a competent engineer.

A paper entitled "Fuel Economy," by J. Henry Hallberg, was then read.

In recent years it has been realized more and more that the methods employed by the average fireman are anything but ideal, and that a great waste of fuel could be avoided if the results of stoking could be improved.

In time great efforts were made, and among the various improvements invented, a prominent position must be allotted to mechanical stokers. There is no doubt that these appliances on the whole handle coal more economically than the average fireman, but they also require attention; and, as they do not eliminate the personal element entirely, even they are in themselves no safe guarantee of good results.

The paper on "Electric Heating," by James I. Ayer, Boston, Mass., was then read.

Mr. Ayer presented a brief paper directing attention to the great possibilities of installing electrical heating devices among residence customers. He showed a table of costs of hot water heating which makes this an attractive proposition. The policy to pursue, he says, is to press the sale of these goods constantly until their own popularity will cause them to come in great demand.

The paper on "Line Construction for Overhead Light and Power Service," by Paul Spencer, was read by W. D. Partridge, who assisted Mr. Spencer in the preparation of the paper.

The points to be considered in line construction in the order of their importance are the following:

First and foremost, to which all others must be entirely secondary—the safety of the public and the company's employes.

Second—The reliability of the company's service.

Third—Sightliness of the construction.

These first two requirements, safety and reliability, can be considered together, the first embracing the second, for safe construction implies reliability of service.

To meet these requirements we should use, first of all, structurally sound material, of ample strength to withstand, under all conditions of service, the strains to which the line may be subjected.

The poles should not have less than seven-inch tops, should be set not less than five feet in the ground and be held firmly by substantial guying against side or end pulls.

The cross-arms should be of sound, honest wood, and not the sap-wood variety, which are covered with so-called red paint to hide their defects, and which are made up of the leavings of the mills after the good wood has been cut into building timber and flooring. They should be firmly bolted to the pole and should be braced.

The line wires should not be less than No. 6 B. & S. gauge in size, and they should be strung with ample clearance over highways and footways and should be inaccessible to the general public from bridges or buildings.

The guy wires should be of stranded cable and not solid wire. They should be insulated and, so far as possible, installed so they can not be easily reached from the ground.

Ground wires should not be installed unless they can be connected to a permanent and effectual ground. A ground wire connected to a poor ground not only fails when it becomes charged to give the protection for which it is supposed to be installed, but becomes a positive source of danger to the passer-by.

For the safety of employes, pole wiring should be carried out in a systematic manner so as to leave space on the pole for climbing and working thereon.

To protect the trimmer, series arc lamps should have absolute cutouts.

The author concluded his paper with lengthy quotations from the line specifiation recently prepared for the electric companies of the United Gas Improvement Company and of the Public Service Corporation of New Jersey.

D. F. Magee read a paper entitled "How to Make a Small Electric Plant Pay."

The boiler room is usually the most neglected part of a small plant equipment. Uncovered pipes, leaky valves and joints, improper boiler setting, careless firing and injudicious selection of fuel, are a few of the dividend-consuming devices common to small plants.

Boilers should be inspected at regular intervals and kept free from scale. Every steam plant should have recording thermometers installed in the feed-water lines to boilers.

Engines should be indicated regularly, and valves adjusted for the most economical steam consumption. Tests of water and fuel consupmtion should be made at stated periods. The distributing system of a small plant is very often the source of considerable waste.

The manager of a small plant must be kept posted regarding the latest and most efficient types of different apparatus, lamps, reflectors, and so forth. He should read all the trade publications; not only the reading matter, but should study the advertisements as well. He will miss a great deal of valuable information if he does not. He will often find the solution in those pages of some difficult problem that has bothered him for months.

It is essential to have a schedule of rates that will attract the long-hour or all-day customers for both light and power.

You must educate the people away from the idea that electric light is for the well-to-do only, for the difference in the yearly cost for redecorating houses where electricity, gas or kerosene is used will often more than pay the entire electric light bill for the year.

On Friday, June 8, the remainder of the technical papers were presented, and in the afternoon an executive session was held, including election of officers as follows:

For President—Arthur Williams, New York, N. Y.

First Vice President—Dudley Farrand, Newark, N. J.

Second Vice-President—Alex Dow, Detroit, Mich.

Secretary and Treasurer—W. C. L. Eglin, Philadelphia, Pa.

Executive Committee to serve three years—Charles R. Huntly, Buffalo, N. Y.; F. M. Tait, Dayton, Ohio; L. A. Ferguson, Chicago, Ill.

THE NATIONAL ELECTRIC LIGHT CONVENTION EXHIBITS.

Among the larger exhibits were the General Electric Company, Schenectady, N. Y.; the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa.; the Allis-Chamlers Company, Milwaukee, Wis.; the H. W. Johns-Manville Company, New York, N. Y.; the Electric Storage Battery Company, Philadelphia, Pa.; the Gould Storage Battery Company, New York, N. Y.

The General Electric Company exhibited a number of tantalum lamps with prismatic reflectors, and several sizes

of the new "Gem" (metallized filament) high-power incandescent lamps with concentrating and diffusing reflectors.

The Westinghouse Electric and Manufacturing Company made the most extensive and elaborate exhibit. This included many forms of motors and generators, measuring instruments, transformers, arc and incandescent lamps, Nernst lamps, Cooper Hewitt mercury vapor lamps and switchboard materials A feature of this exhibit was a large working model of a single-phase wattmeter.

The Allis-Chalmers Company made a very attractive exhibit, showing a line of motors and generators. The sh wing of turbine parts attracted a great deal of attention.

The Electric Storage Battery Company, Philadelphia, Pa., made an exhibit of large and small cells, an automatic refilling siphon, an indicating alarm hydrometer, and a twenty-point, 2000 ampere end-cell switch, both motor-driven and manually controlled, and a drop-shutter indicating end-cell switchboard.

The H. W. Johns-Manville Company had a very attractively illuminating changing electric sign. The company showed a line of fuse specialties and service boxes and insulators.

The Dearborn Drug and Chemical Works, Chicago, Ill., exhibited samples of chemical compounds. Represented by George R. Carr, assistant general manager; H. G. McConnaughy and W. McVicker.

The National Brake and Electric Company, Milwaukee, Wis., exhibited a line of motors and generators and air brake apparatus.

The Gould Storage Battery Company, New York, N. Y., exhibited several sizes of cells for central station service.

The General Storage Battery Company, New York, N. Y., exhibited the "Bijur high duty" battery and battery auxiliaries.

The Simplex Electric Heating Company, Cambridge, Mass., made an elaborate display of heating and cooking utensils. Demonstrations were given and electrically cooked refreshments served.

The Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass., exhibited arc lamps, circuit breakers, current regulators and transformers.

The Fibre Conduit Company, Orangeburg, N. Y., showed sections of fibre conduit.

The Wagner Electrical Manufacturing Company, St. Louis, Mo., exhibited transformers, single-phase elevator motors and controllers and switchboard and testing instruments.

ALLIS-CHALMERS TURBO-GENERATOR FOR MERIDEN ELECTRIC LIGHT COMPANY, MERIDEN, CONN.

The Meriden Electric Light Company, of Meriden, Conn., has recently placed its order with the Allis-Chalmers Company of Milwaukee, for a 500 kilowatts Allis-Chalmers turbo generator unit for lighting and power purposes, to be installed at the power house in Meriden late in the fall.

In addition to the turbine and generator proper, the Allis-Chalmers Company will also furnish a structural steel foundation frame and a surface condenser with 2000 square feet of cooling surface, including centrifugal circulating pumps, air pumps, etc.

The turbo-generator is the standard 500 kilowatt Allis-Chalmers construction, wound for sixty cycles, 2300 volts, two phase, with a steam pressure of 125 pounds per square inch. The turbine is direct connected to the revolving field of the generator. The turbine and alternator rotors, each carried on two bearings, will rest on a continuous bed plate which is provided with suitable slides to allow for the expansion and contraction of the turbine cylinder, and in order to preserve the alignment of the entire unit

Units similar to this one are now on order for the city of Jacksonville, Florida, the Western United Gas and Electric Company of Aurora, Ill., and the Munice Electric Light Co. of Munice, Ind. Both turbine and alternator are the products of the Allis-Chalmers Company. The alternator will be built at the Company's electrical works, Cincinnati, Ohio, and the turbine will be built in the West Allis, Milwaukee, works.

ALLIS-CHAMLERS CENTRIFUGAL PUMPING UNIT FOR THE PURDUE UNIVERSITY.

Purdue University, Lafayette, Indiana, is enlarging its present machinery equipment for the engineering laboratory by the addition of an Allis-Chalmer centrifugal pump, to be directly connected to a horizontal, Corliss engine.

The centrifugal pump is of the standard, horizontal type, having double suction for perfect lateral balance of enclosed impeller. The pump has a nominal capacity of four thousand gallons per minute against a total head of ten feet, when operated at maximum efficiency, and a capacity of ten thousand gallons per minute under certain conditions.

The pumping unit is for laboratory work and will be provided with all the necessary adjuncts for careful testing and accurate experimental work.

This order was placed with the Allis-Chalmers Company by Professor W. F. M. Goss, Dean of Schools of Engineering.

Book Reviews.

The well-known "Electrical Engineers' Pocket Book," compiled and edited by Horatio A. Foster, has passed to its sixth edition.

For the electrical engineer the data which has been carefully selected and brought together in the form of this pocket book is indispensable. The new edition shows many improvements, the section upon electric railways, for instance, being particularly complete, very fully covering the ground as required at the present time.

The tables and general information are the same as in the older editions, the particularly satisfactory arrangement of tables having been continued as originally put forth in the first edition. It can almost be said that this book is a necessary adjunct for every engineer's desk and working room.

The Sibley Journal of Engineering, of Cornell University, June number, contains, among other articles an excellent description of the steam equipment including boiler and engine which is used on the White Motor Car, ordinarily spoken of as the White Steamer. A short biography is also given of Mr. Rollin H. White, a graduate of Cornell in 1894, who while with the White Sewing Machine Company began experimenting upon the steam equipment which has been so far perfected as to stand alone for automobile use. The weak point in steam cars has certainly been the boiler, and particular attention is given to the description of the boiler ane furnace in Prof. Carpenter's article. Mr. Harry H. Norris, in the same issue, gives in detail the experimental work of the Electric Railway Test Commission, which was organized in connection with the Louisiana Purchase Exposition. The methods employed in making the tests and many of the results are given.

PLAN TO FIGHT BELL MONOPOLY.

Announcement was made on Wall Street, New York, last week, that the tentative plans are being worked out the unification of all large independent telephone interests of the country for the purpose of greater development and for resisting the Bell monopoly.

A committee representing the principal independent companies has been in session in New York for several days, and this committee will report to the meeting of telephone companies which has been called for next Tuesday, Wednesday and Thursday in Chicago. Representatives of all independent companies in the United States will be present at this meeting, and details of this movement will be threshed out.

A NEW METHOD OF UTILIZING RESIDUALS OF GAS MAKING.

A considerable amount of interest, says the "Indian and Eastern Engineer," has recently been aroused amongst Gas Works Engineers in England in connection with a new method of profitably disposing of spent gas lime. Where slaked lime is used in the process of purification of coal gas used for lighting and other purposes it has become a question of a very serious nature as to how the enormous quantities of this comparatively useless material could best be disposed of at the least possible loss. Especially is this the case in large towns and cities where the facilities for carting the material away and tipping it on to waste land are limited. It is quite true that the idea of revivifying spent gas lime is not by any means novel, as it has been fully realized for a long time that a great deal of loss might be avoided, and considerable economy effected in the cost of manufacture, if some means could be found of treating the waste lime from the purifiers in such a way that the impurities absorbed in the process of purification could be driven off, and so bring the lime to its original state as near as possible. The subject is one that has received a considerable amount of attention for years past, but notwithstanding the many efforts that have been put forth on the part of numerous inventors, the problem has never up to the present been satisfactorily solved. In practically every instance the object aimed at has apparently been to so treat the lime that it could be used over again from time to time in the purifiers, but the cost of the requisite plant and the amount of labour entailed in dealing with the waste product has invariably proved so costly that it has been found impossible to adopt the system of treatment with anything like economical results. Moreover, in addition to the objection of excessive cost of treatment, it has been found that the lime could not be restored to such a degree of purification as to yield results equal to those obtained where fresh lime is employed. In many places, the question of getting rid of the huge accumulations of spent lime has assumed such serious proportions, that many Gas Companies have abandoned the use of lime as a purifying agent and had to resort to the use of oxides of iron instead, although in the latter case it is a generally admitted fact that the gas obtained is not of such a pure quality as where lime is used. An outlet was found to a certain extent by disposing of the waste lime to farmers for using on land as a fertilizer, but as the material is in most cases supplied gratis to the farmer, and in addition freight has to be paid by the Gas Company to the nearest station as an inducement to the farmer to take delivery, as well as a commission in some cases to a local agent, this was anything but a profitable solution of the difficulty. As much as 2*s*. to 3*s*. per ton has frequently been returned as the cost of disposing of "spent" lime. When the thousands of tons accumulated in a large work, in the course of a year's production of gas are taken into consideration, this item of expenditure becomes one of grave importance. Any practical method of successfully dealing with so serious a problem, and so converting a loss of this description into a profit, is of a certainty, therefore, bound to command the close and careful attention of all interested in the manufacture of gas.

M. G. Joseph Lowden, J. P., of Leeds, late Chairman of the Gas Committee of the Leeds Corporation, along with Mr. J. Bond, manager of the Southport Gas Works, are the inventors of a process which has come under our notice recently for treating spent gas lime, which promises to satisfactorily solve the difficulties referred to.

For some time past, very exhaustive and careful experiments have been carried out at the New Wortley Stations of the Corportions Gas Works at Leeds, with a view to proving the utility of Messrs. Lowden's and Bond's invention, and the results attained were of such a highly satisfactory nature that the Corporation decided after close investigation to go thoroughly into the matter on practical commercial lines. Messrs. Lowden and Bond in their method of treatment do nto aim at producing the lime in such a condition that it can be used again in the purifiers. The invention, on the other hand, is designed for delivering the lime after treatment, in such a state that it can be used as a binder for mixing with pulverized clinker or other material and subsequently formed into bricks for building purposes and paving blocks, etc. The revivified lime in reality takes the place of ordinary slaked lime, as used in the process of sand-lime brickmaking. It will be seen therefore that two residuals are in this way disposed of, viz., the spent lime and clinker. Clinkers of highly vitrified character, very suitable for this purpose, are produced in large quantities from the furnaces of all gas works, so that it is not necessary to go outside the works for either of the raw materials in the majority of cases. Towns Refuse Destructor Clinker, however, can be employed for the same purpose, if desired, and as both gas undertakings and the Refuse Destructors form part and parcel of up-to-date corporations' equipments in these days it can be quite easily arranged for the by-products from each to be used together for the general and mutual benefit of the two departments, where a sufficient quantity of clinker is not available from the gas works alone.

As the invention has now successfully passed quite beyond the experimental stage, there is no doubt, that a great deal more will be heard about the "Leeds" process in the near future. Although the original experiments, however, were carried out at Leeds, that city has lost the distinction of being the first to put the process to practical and profitable use. Over twelve months ago a complete installation of plant was erected at Plymouth for the Plymouth and Stonehouse Gas Light and Coke Company, and to this enterprising company must be accorded the credit of being the first gas works to put down a plant on this particular system for utilizing its waste products in a profitable fashion. The plant at Plymouth has already produced an enormous quantity of bricks of excellent quality, and these are finding a very ready market amongst contractors and builders in the district, and yielding a profit on the cost of manufacture, fully justifying the expenditure in the plant.

During the early stages of the experiments at Leeds, certain bricks were submitted to Professor Goodman of the Yorkshire College, Engineering Department, and as will be observed from the report which is appended of the tests made with these samples, the results were of a highly satisfactory character in every respect. The following is a copy of Professor Goodman's report:

REPORT ON TESTS OF BLUE BRICKS

Submitted by Alderman Lowden, chairman, Gas Committee, Leeds.

Dimensions in Inches.		Area	Cracked at		Broke.		Remarks		
		Sq. Ins.	Tons	Tons Sq. Ft.	Lbs.	Lbs. Sq. In.			
1.48	1.60	2·37			890	376	Tested in Tension.		
1.46	1.61	2.35			1,031	449	"	"	
1.49	1.64	2.44			1,128	462	"	"	
		Sq. Feet			Tons	Tons Sq. Ft.			
9.00	4.70	0.294	34	116	101	344	Not broken in any case.	Tested in compression.	After soaking in water 24 hours, Dry.
"	"	"	98.6	335	101	344			
"	"	"	67.4	229	101	344			

Limit of Machine

In my opinion these are excellent results, both in tension and compression. (Signed) JOHN GOODMAN.

In developing and perfecting the mechanical side of the invention Messrs. Lowden and Bond became at the outset associated with Messrs. Wm. Johnson & Sons (Leeds), Limited, of Castleton Foundry, Leeds, a firm well known

throughout the world for their long connection with the invention and manufacture of various types of machinery and plant used in the manufacture of bricks. Messrs. Johnson were at that time identifying themselves conspicuously with the introduction of a plant for the production of bricks from a mixture of sand and hydrated lime, and as there was of course a certain analogy between the system they were exploiting and the application of the "Lowden Bond" process of brickmaking, the experience they had gained was naturally brought to bear to a very useful extent in the designing and construction of suitable machinery for the desired object. The plant fitted up at Plymouth was built and erected throughout by this firm in conjunction with the patentees. For some months past Messrs. Wm. Johnson & Sons have been busily engaged erecting similar plant for the Leeds Corporation Gas Committee at the New Wortley Station, and in all probability by the time this article appears in print, this installation will have started to work. The writer recently had the privilege of looking over the plant, which at that time was just upon the verge of completion. He was also shown a number of bricks and paving blocks, made on the experimental plant, and these were of a very hard durable character, almost unbreakable, and in every way suitable for any of the numerous purposes for which engineering bricks are used. In order to practically test the wearing qualities of the material a small patch of the main entrance to the works had been paved with blocks made from the gas lime and the clinker. This was put down at a point where the cart traffic is particularly heavy, but although the blocks had been exposed to many months of wear and tear in this position, there were no signs of any undue wear having taken place, and to all outward appearance the severe test they had been subjected to, established the fact beyond doubt that the materials after treatment were unquestionably capable of producing a brick or tile of intense hardness and durability. The appearance unfortunately is not a very pleasing one, the bricks being a dark grey color, so that it is hardly expected they will be used to any extent for outside facing work, excepting in cases where color is immaterial. As brick for inside walling, foundations and general engineering purposes however, nothing better could be desired, and the cost of manufacture is so economical we understand, that they can be produced and sold at a price to compete favorably with ordinary common bricks, and still yield a good margin of profit, especially when the minus value of the materials used is taken into consideration.

The process of manufacture is an incredibly quick one, as the raw materials can be taken in their crude form and converted into finished bricks ready for use in the remarkably short period of twenty-four hours. The percentage of water absorption is very low, being only from four and one-half per cent. to five per cent., and the fire-resisting qualities of these bricks are equally good, there being only one per cent. of combustible matter in the bricks. Exhaustive tests were also made by an eminent Westminster engineer, not only with regard to crushing strengths and absorption, but also under very severe and rapid changes of temperature, ability to withstand acids, etc., and the results were in the highest degree satisfactory.

Los Angeles, Cal.—The West Coast Steel Company, incorporated under the laws of California last week, with a capital stock of $100,000, will erect a plant in this city with a capacity of 15,000 tons a year, and has leased ground for the purpose. The erection of the buildings will commence at once.

Reno, Nevada—Fire last Sunday morning destroyed the auxiliary plant of the Reno Light and Power Company, doing more than $50,000 damage. As a result the city will be without lighting for fully one month.

STRESSES OF IRON AND STEEL.

At a recent meeting of the Institution of Civil Engineers, London, England, Sir Alexander R. Binnie, president, in the chair, the paper read was: "On the Resistance of Iron and Steel to Reversals of Direct Stress," by T. E. Stanton, D. Sc., M. Inst. C. E., and L. Bairstow, A. R. C. S. The following is an abstract of the paper:

While recogizing the valuable work which has been done by previous observers in the study of the fatigue of metals the authors call attention to the fact that further experimental work on the subject is much needed for the following reasons:

1. Practically all the previous work, with the exception of Reynold's and Smith's experiments, have been done by subjecting the mterials to transverse stresses, the intensity of which has, therefore, to be calculated by the ordinary theory of bending.
2. The resistance of the materials in common use by engineers at the present day when subject to reversals of stress is imperrfectly known, and there exists considerable difference of opinion as to the materials best suited for stresses of this kind.
3. Although it appears from Reynolds and Smith's experiments that the resistance of iron and steel is seriously diminished when the alterations are very rapid (i. e., 1500 to 2000 per minute), it is not known if this reduction in resistance is considerable at those speeds which are common in high-speed reciprocating motors (i. e., in the neighborhood of 800 reversals per minute), since the majority of experiments have been made at approximately sixty reversals per minute.
4. Although it is generally recognized that the effect of moderately rapid or sudden changes in section of materials subject to reversals of stress is to diminish their resistance, the amount of this reduction in strength for the various materials commonly used is not known.
5. The common assumption that, in cases in which the stress varies from tension to compression, but between unequal limits, the resistance depends solely on the range of stress and not on the actual values of these limits, has not been experimentally verified.

From these considerations it was decided to undertake a research, the object of which should be the experimental determination of the resistance of certain kinds of iron and steel, under the special conditions mentioned in the above paragraphs, when subject to reversals of direct stress.

The experiments were made on the alternating stress testing machine which has been designed and constructed at the National Physical Labratory.

Jointly with this work a microscopical investigation has been made of the changes which take place in the crystalline structure of materials.

The materials upon which tests have been made may be conveniently divided into three groups:

1. Three samples of Swedish Bessemer steel and one sample of Swedish charcoal iron presented by Mr. R. A. Hadfield for the purpose. The carbon contents of the steels was approximately 0.17, 0.44 and 0.64 per cent.
2. Four samples of steel presented by Messrs. Belliss and Morcom for the purpose. Of these, two were mild steel bars, one was a bar of harder steel used for piston rods, and the fourth consisted of specimens which had been cut from a large steel forging.
3. Two samples of wrought-iron of British manufacture, bought for the purpose of the tests.

Although more uniformity in the results of the tests would no doubt have been obtained by subjecting all the specimens cut from any given material to an annealing process, it was felt that this would detract from the value on the tests owing to the well known effect of heat treatment of the resistance of steel. For this reason the tests were

made on the bars as received; and in cases in which there bars were several of the same material the specimens in any group of tests were not always cut from the same bar. This does not apply to the case of the specimens whose structure was examined microscopically, in which the actual resistance was of secondary importance.

The results of the experiments may be stated briefly as follows:

1. The superiority, in resistance to reversals of stress, of moderately high-carbon steels over low-carbon steels and wrought irons, which was discovered by Wohler to exist when the rate of reversals was sixty per minute, still holds when this rate is increased to 800 per minute, although according to Reynolds and Smith's experiments this superiority no longer exists when the rate of reversals is in the neighborhood of 2000 per minute.
2. As far as comparisons can be made between the results of the present experiments and those of Wohler and Sir Benjamin Baker, there is no marked reduction in resistance due to raising the rate of reversals to 800 per minute.
3. Experiments in which the ratio of tension to compression varied from 1.4 to 0.72 indicated that between these limits the value of the maximum range of stress was practically independent of the actual values of the limiting stresses in tension and compression.
4. The resistance of the materials in three tpyical cases of rapid reduction of area of the specimens has been determined.
5. The failure of iron specimens due to the development of the slip-lines of Ewing and Rosenhain into the cracks has been determined for the case of direct stress; and the failure of moderately high-carbon steel, due to the development of cracks in the ferritic area of the structure has also been established.

Eugene, Or.—The East Park telephone line has been organized by John A. Gibson and H. C. Peterson, on the East River road. The line will connect with the Pacific States Telephone Company at that place.

New Westminster, B. C.—The telephone company is about to lay a new cable across the Fraser River for the further improvement of the Chilliwack, Blaine and Lander service.

Nelson, B. C.—A new company has been formed to generate power for supplying Moyie and Cranbrook and the neighboring towns with electric light and power. The promoters are Charles Mackay, R. Campbenn, J. A. A. McDonald and J. D. Mackay of Moyie, W. Hanwell of Port Hammond and L. Shaw, and Mrs. H. Ross of Vancouver; capital $1,500,000.

Pacso, Wash.—The City Council granted R. A. Klinge a franchise for a local telephone exchange.

Meadows, Idaho—J. E. Goodman and B. A. Chrisholm are planning to build an electric plant at Little Salmon Falls, sixteen miles north. Power generated will be used for working the Huckleberry group of mines on Granite mountain for lights and other purposes.

Bellingham, Wash.—A mile and a half of street railway extension at a cost of $10,000 will be made in South Bellingham by the Whateem County Railway and Light Company soon.

Eugene, Or.—Work has commenced on the foundation for the building to be used for the gas plant of the Willamette Valley Company. The building is to be 40 x 100 feet.

North Yakima, Wash.—Work has commenced on the new power house of the Northwest Light and Power Company. The new plant will be located fifty-one miles from this city in the Naches valley.

ERIE RAILROAD DECIDES TO OPERATE ELECTRIC TRAINS.

The management of the Erie Railroad, which, with commedable foresight towards a constant betterment and improvement of that immense railroad system, has for the last two years conducted a thorough investigation into the possibilities of electricity as railway motive power, at a recent meeting of the Board of Directors decided to take the initial steps of operating electric trains by contracting with Westinghouse, Church, Kerr & Co. for the installation of an electric system on its Rochester and Mount Morris division, a distance of 35 miles.

This decision of the Erie Railroad management seems to be of the greatest importanec when the facts are taken into consideration which led up to it. The company's electric board, which consists of such eminent engineers as J. M. Graham, D. J. Arnold, L. B. Stillwell and A. M. Williams, has had the matter under advisement for a period of two years. Mr. Graham has been on a personal tour of inspection of electric railway systems in this country, as well as in Europe, and there cannot be any doubt that the recommendation of the Board in favor of electricity is about as high an approval as electric railway propulsion could ask for.

The cars will be operated by single-phase motors, probably four at 150 horsepower capacity each to one car. The line construction calls for the single-phase catenary trolley system. The cars will be used to haul passenger as well as freight cars. The power for the operation of the road is to be obtained from the Niagara Falls Power Plant.

NEW YORK TELEPHONE COMPETITION.

Mr. John M. Shaw, president of the Atlantic Telephone Company, has formally presented its two-cent telephone proposal to the New York Board of Estimate. The Company is willing, with two exceptions, to agree to the terms proposed for the company by the Bureau of Franchises, if the city desires to operate on that basis, but if the city desires to operate on the basis informally discussed by Controller Metz and Martin W. Littleton, counsel for the company, at the recent public hearing on its application, an agreement can be reached along those lines. Mr. Shaw objects to the requirement of an initial $250,000 payment to the city and the clause allowing the city to control the capitalization of the company. He insists on $100,000 as a first payment, and wants no restrictions in regard to capitalization. He also wants the city to guarantee the right of entry to the conduits of the Empire City Subway Company. If the company can have free use of the subways it will "enter into a contract to furnish telephone service from any part of New York City, to any other part of New York City at a flat rate for business purposes and unlimited service of $108 per year, and a flat rate for residences and unlimited service of $66 per year, and for such subscribers who do not wish to enter into a contract for unlimited flat rate service the Atlantic Telephone Company will agree to furnish them measured service at 2 cents a call wholly within any borough and 5 cents a call between boroughs."—"Electrical World."

Bellingham, Or.—J. L. Likins was awarded the contract for excavating for a new exchange building for the Home Telephone Company.

Seattle, Wash.—John McQuade, of Issaquah, obtained from the county commissioners a franchise for the construction of an electric railway from Issaquah to Renton and Seattle.

Rossland, B. C.—The Trail electric light plant, owned by the Consolidated Mining and Development Company, was burned to the ground. Loss $18,000.

News Notes.

New Westminster, Wash.—Work on the Ruskin-Stave Falls line is progressing rapidly.

Portland, Or.—Work will be commenced at once by construction gangs of the Portland Railway Company in building the Council Crest extension.

Seattle, Wash.—The city and the Seattle Electric Company will join in the construction of a pole line on Interlake avenue, to be used for the street railway and the city lighting system.

Tacoma, Wash.—The Tacoma Railway and Power Company announces through its attorney, B. S. Grosscup, that it intends to build its line on Commerce street, between Seventh and Ninth.

Vancouver, B. C.—By the purchase of terminal grounds in the Hadden tract east of Vancouver barracks the building of the Vancouver and Suburban electric road is assured.

Wenatchee, Wash.—F. R. Bingham, a representative of the Pacific States Telephone and Telegraph Company, is looking over the valley with the object of the establishment of a system of rural telephone lines through the Wenatchee valley in competition with the Farmers' Telephone Company.

Portland, Or.—Bids will be received by Dan J. Maher for furnishing the Port of Portland with 500 feet of thirty-inch pontoon pipe.

Seattle, Wash.—If plans of Dr. J. E. Crichton, of the fire and water committee of the City Council, are carried out, the bids for the $2,500,000 extension and improvements to the water system will call for completion by July 3, 1907.

Washington, D. C.—The naval appropriation bill, as finally agreed to by Congress, carries the following amounts for the navy yard: Puget Sound, $100,000 to begin construction of a stone and concrete dry dock, to cost when completed $1,250,000; central power plant, $60,000; sewer extension, $3000; grading, $10,000; electric light extensions, $5000; water system, $2500; heating system, $4000; dredging, $10,000; roads and walks, $2500; telephone system, $1500; lavatories, $2500, enlargement of the construction plant, $20,000; total, $225,000.

Porterville, Cal.—The initial steps are being taken to form a railroad company here to be known as the Sierra Pacific Railway Company, and to have a capital stock of $200,000, part of which is to be subscribed by San Francisco and San Jose capitalists and the balance by Tulare county people. The line is to be constructed from Springville, in the eastern Tulare county mountianous region, to Porterville, and from there to extend it toward the interior towns.

Tocoma Wash.—"War to the knife, and the knife to the hilt," has been declared against the farmers' telephones of the Palouse country by the Pacific States Telephone Company, which owns the first telephone line built through the inland empire, and now covers the entire Pacific Coast with sundry miles of wire and hundreds of thousands of telephones. The company has made a rate of $1 per year. The rural telephone lines of Eastern Washington began to have a serious effect on the business of the telephone company. These lines, beginning with a single one with four telephones, composed of barbed-wire fences and phones bought from a Chicago department house eight years ago, have grown into a large system, or series of systems, covering all of the Palouse country, with more than 1800 patrons in Whitman county alone. Telephone exchanges are maintained in all of the large towns and many of the smaller villages.

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Portland, Or.—Ground was broken on Grover street by the United Railways Company for the line through the city to connect with the interurban road from Salem.

Seattle, Wash.—A franchise was granted to the Seattle Electric Company by the Council for the construction of a line on Fifeenth avenue, n.

Sand Point, Idaho—Manager George Andrews, of the Rocky Mountain Bell Telephone Company has recieved instructions to proceed with the building of the toll lines to Bonners Ferry and Hope.

Twin Bridges, Mont.—It is reported that the Conrey Placer Mining Company, of Ruby, is to construct a large reservoir above the upper canyon on the Madison River, and will erect two power plants, one at the head and the other at the foot of the canyon.

Washington, D. C.—The War Department is completing plans for the extension of the Alaska cable at an outlay of $135,000. It is proposed to tap the cable in Frederick Sound and run a loop to Petersburg thence to Wrangell, to Hadley o Prince of Wales Island and to Ketchikan.

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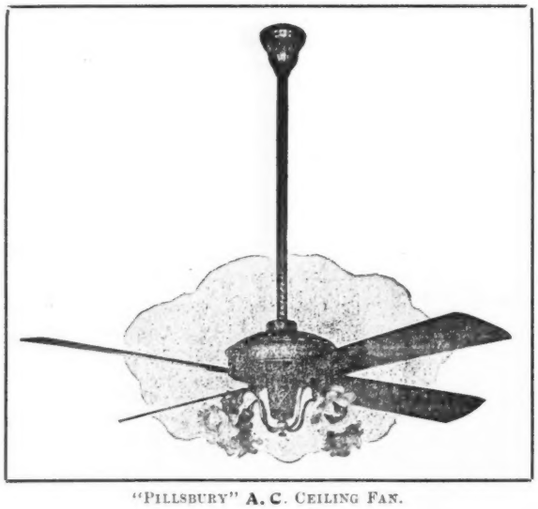

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If you have any and can spare same we would request that you forward them to our office, Atlas Building, 606 Mission Street, San Francisco. We have constant need of back issues of THE JOURNAL, and as our reserve copies (including our bound volumes) were entirely destroyed by the fire, we must depend upon the kindness of our friends in replacing same.

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We request each of our subscribers to send us his name and address and date of last payment; also copy of receipt therefor, in order that we may compare same with such of our records as were saved from the fire and avoid any possible errors or omissions. Also, all San Francisco subscribers should send us their new addresses in order to facilitate prompt delivery through the post-office.

Washington, D. C.—The new naval wireless station at Point Loma, Cal., has been opened. A station will be established at Cape Flattery as soon as the Navy Department can extend the $65,000 appropriated for Pacific wireless stations.

Lewiston, Idaho—The City Council is planning to purchase a chemical engine, also to install an alarm system.

Anacortes, Wash. — The Home Telephone Company of Puget Sound has made application to the City Council for a twenty-five year franchise to install an automatic telephone system.

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